

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An imaging system for a vehicle, said imaging system comprising:  
a camera module positionable at the vehicle, said camera module comprising a plastic housing and an imaging sensor, said plastic housing including a first portion and a second portion, said first portion and said second portion being one of laser welded and sonic welded  
5 together to substantially seal said image sensor and associated components within said plastic housing; and  
a control operable to process images captured by said image sensor.
2. The imaging system of claim 1 including a sealing material at said plastic housing to seal the pores of said plastic housing.
3. The imaging system of claim 1 including a heating element operable to heat at least one of a transparent cover of said housing and an interior chamber of said housing.
4. The imaging system of claim 1, wherein said first portion comprises a connector portion and includes a connector at an end thereof and said second portion comprises a camera portion and includes a transparent cover portion for receiving an image therethrough.
5. The imaging system of claim 4, wherein said transparent cover is one of laser welded and sonic welded to said camera portion.
6. The imaging system of claim 1, wherein said camera module is positioned in a movable housing that is movable relative to an exterior portion of the vehicle to move said image sensor between a stored position generally within the portion of the vehicle and an operational position where said image sensor is positioned to have a field of view exteriorly  
5 of the vehicle.
7. The imaging system of claim 6, wherein said movable housing comprises a transparent panel, said transparent panel being positioned at least partially across an opening of said housing and generally in the field of view of said image sensor.

8. The imaging system of claim 7, wherein said movable housing comprises a panel cleaning device positionable at the exterior portion of the vehicle and configured to engage an exterior surface of said transparent panel to clean said transparent panel as said housing moves said image sensor between said stored position and said operational position.
9. The imaging system of claim 7, wherein said housing is configured to receive an illumination source, said illumination source being directable toward the exterior scene when said housing moves said image sensor to said operational position.
10. The imaging system of claim 9, wherein said transparent panel is positioned in front of said illumination source.
11. The imaging system of claim 9, wherein said transparent panel comprises a first transparent panel positioned in the field of view of said image sensor and a second transparent panel positioned in front of said illumination source.
12. The imaging system of claim 1 including at least one illumination source, said control being operable to selectively activate said at least one illumination source in response to a detected ambient light level decreasing to a threshold level.
13. The imaging system of claim 12, wherein said control is operable to apply an infrared contribution correction to the detected levels for at least some of the colors detected by said image sensor to adjust a color balance of said image sensor.
14. The imaging system of claim 12, wherein said at least one illumination source comprises a visible light source, said control being operable to limit or block infrared and near infrared light present in the illuminated scene to reduce processing requirements.
15. The imaging system of claim 12, wherein said control is operable to selectively switch said image sensor from a color mode to a black and white mode in response to the reduced ambient light level.
16. The imaging system of claim 1, wherein said housing includes a ventilation portion, said ventilation portion being at least partially permeable to water vapor to allow water vapor

to pass therethrough while substantially precluding passage of at least one of water droplets and contaminants.

17. An imaging system for a vehicle, said imaging system comprising:  
a vented camera module, said vented camera module comprising a housing and an image sensor, said housing including a ventilation portion, said housing being configured to receive said image sensor therein, said ventilation portion being at least partially permeable to  
5 water vapor to allow water vapor to pass therethrough while substantially precluding passage of at least one of water droplets and contaminants; and  
a control for processing images captured by said image sensor.
18. The imaging system of claim 17, wherein said ventilation portion comprises a Gore-Tex area.
19. The imaging system of claim 17 including a heating element operable to heat the interior of said housing to limit condensation from forming within said housing.
20. The imaging system of claim 19, wherein said heating element is selectively activatable in response to a signal from a temperature sensor of said imaging system, said signal being indicative of a threshold temperature within said housing.
21. The imaging system of claim 20, wherein said heating element is selectively deactivatable in response to a second signal from said temperature sensor, said second signal being indicative of a second threshold temperature within said housing.
22. The imaging system of claim 19, wherein said heating element is operable to at least one of (a) dry out moisture within said housing and (b) drive out moisture through said ventilation portion.
23. The imaging system of claim 17, wherein said camera module comprises a movable housing that is movable relative to an exterior portion of the vehicle to move said image sensor between a stored position, where said image sensor is positioned generally within the portion of the vehicle, and an operational position, where said image sensor is positioned to  
5 have a field of view exteriorly of the vehicle.

24. The imaging system of claim 23, wherein said movable housing comprises a transparent panel, said transparent panel being positioned at least partially across an opening of said housing and generally in the field of view of said image sensor.
25. The imaging system of claim 24, wherein said movable housing comprises a panel cleaning device positionable at the exterior portion of the vehicle and configured to engage an exterior surface of said transparent panel to clean said transparent panel as said housing moves said image sensor between said stored position and said operational position.
26. The imaging system of claim 17 including at least one illumination source, said control being operable to selectively activate said at least one illumination source in response to a detected ambient light level decreasing to a threshold level.
27. The imaging system of claim 26, wherein said control is operable to apply an infrared contribution correction to the detected levels for at least some of the colors detected by said image sensor to adjust a color balance of said image sensor.
28. The imaging system of claim 26, wherein said at least one illumination source comprises a visible light source, said control being operable to limit or block infrared and near infrared light present in the illuminated scene to reduce processing requirements.
29. The imaging system of claim 26, wherein said control is operable to selectively switch said image sensor from a color mode to a black and white mode in response to the reduced ambient light level.
30. The imaging system of claim 17, wherein said housing comprises a first plastic portion and a second plastic portion, said first plastic portion being one of laser welded and sonic welded to said second plastic portion to substantially seal said image sensor and associated components within said housing.
31. An imaging system of a vehicle, said imaging system comprising:  
an imaging device operable to capture images of a scene occurring exteriorly of the vehicle;

5 a holding device for movably holding said imaging device, said holding device comprising a housing, a transparent panel and a panel cleaning device, said housing being movably mountable at an exterior portion of a vehicle, said imaging device being positioned within said housing, said transparent panel being positioned at least partially across an opening of said housing and generally in the field of view of said imaging device, said housing being movable relative to the exterior portion of the vehicle to move said imaging  
10 device between a stored position, where said imaging device is positioned generally within the portion of the vehicle, and an operational position, where said imaging device is positioned to have a field of view exteriorly of the vehicle, said panel cleaning device being positionable at the exterior portion of the vehicle and configured to engage an exterior surface of said transparent panel to clean said transparent panel as said housing moves said imaging  
15 device between said stored position and said operational position; and  
a control operable to process images captured by said imaging device.

32. The imaging system of claim 31, wherein said housing is pivotably mountable at the exterior portion of the vehicle.

33. The imaging system of claim 31, wherein said housing is slidably mountable at the exterior portion of the vehicle.

34. The imaging system of claim 31, wherein said housing moves said imaging device to said operational position in response to engagement of a reverse gear of the vehicle.

35. The imaging system of claim 31 including a spraying device operable to spray fluid onto said transparent panel.

36. The imaging system of claim 31 including an illumination source that is selectively operable to illuminate the exterior scene.

37. The imaging system of claim 36, wherein said housing is configured to receive said illumination source, said illumination source being directable toward the exterior scene when said housing moves said imaging device to said operational position.

38. The imaging system of claim 37, wherein said transparent panel is positioned in front of said illumination source.
39. The imaging system of claim 38, wherein said transparent panel comprises a first transparent panel positioned in the field of view of said imaging device and a second transparent panel positioned in front of said illumination source.
40. The imaging system of claim 38, wherein said control is operable to selectively activate said illumination source and said imaging device when said imaging device is moved to said stored position to determine if moisture is present on said transparent panel.
41. The imaging system of claim 36, wherein said control is operable to selectively activate said illumination source in response to at least one of (a) said imaging device being in said operational position and (b) a detected ambient light level decreasing to a threshold level.
42. The imaging system of claim 36, wherein said illumination source comprises a visible light source, said control being operable to limit or block infrared and near infrared light present in the illuminated scene to reduce processing requirements.
43. The imaging system of claim 36, wherein said control is operable to apply an infrared contribution correction to the detected levels for at least some of the colors detected by said imaging device to adjust a color balance of said imaging device.
44. The imaging system of claim 31, wherein an outer panel of said housing defines an exterior cover portion at an exterior surface of said exterior portion of the vehicle when said imaging device is moved to said stored position.
45. The imaging system of claim 31 including a display operable to display the image captured by said imaging device.
46. The imaging system of claim 31, wherein said imaging device comprises a color imaging sensor operable to capture color images of the exterior scene and an infrared imaging sensor operable to capture infrared images of the exterior scene, said control selectively

activating one of said color imaging sensor and said infrared imaging sensor in response to  
5 the ambient light intensity present in the exterior scene.

47. The imaging system of claim 31, wherein said housing is movable to selectively position said imaging device in first and second operational positions.

48. The imaging system of claim 47, wherein said control is operable to determine a distance to at least one object in response to processing of images captured by said imaging device when in said first and second operational positions.

49. The imaging system of claim 47, wherein said control is operable to selectively move said housing to position said imaging device at said first operational position in response to the vehicle making an initial approach to a target zone and to position said imaging device at said second operational position in response to the vehicle moving further into the target  
5 zone, said imaging device being directed more downward when in said second operational position relative to said first operational position.

50. An imaging system of a vehicle, said imaging system comprising:  
an imaging device operable to capture images of a scene occurring exteriorly of the vehicle;  
a holding device pivotally mountable at a portion of a vehicle, said holding device  
5 comprising a housing having an exterior panel and a transparent panel, said imaging device being positioned within said housing, said transparent panel being positioned at least partially across an opening of said housing and generally in the field of view of said imaging device, said holding device being pivotable relative to the portion of the vehicle to move said imaging device between a stored position, where said imaging device is positioned generally  
10 within the portion of the vehicle, and an operational position, where said imaging device is positioned to have a field of view exteriorly of the vehicle, said exterior panel being generally aligned with an exterior surface of the portion of the vehicle and said transparent panel being generally within the portion of the vehicle when said imaging device is in said stored position; and  
15 a control operable to process images captured by said imaging device.

51. The imaging system of claim 50, wherein said holding device includes an interior panel that is pivotally mounted at the portion of the vehicle, said interior panel and said exterior panel defining a cavity of said housing for receiving said imaging device.
52. The imaging system of claim 51, wherein said interior panel includes a pivot member that is pivotally attachable to a corresponding pivot portion of the portion of the vehicle.
53. The imaging system of claim 52, wherein said pivot member is pivotally attachable to a corresponding pivot portion of the vehicle that is positioned interiorly of the exterior surface of the portion of the vehicle.
54. The imaging system of claim 50, wherein said holding device includes a cleaning device for cleaning said transparent panel, said cleaning device being positionable at the portion of the vehicle and configured to engage an exterior surface of said transparent panel to clean said transparent panel as said holding device moves said imaging device between  
5 said stored position and said operational position.
55. The imaging system of claim 50, wherein said holding device moves said imaging device to said operational position in response to engagement of a reverse gear of the vehicle.
56. The imaging system of claim 50 including an illumination source that is selectively operable to illuminate the exterior scene.
57. The imaging system of claim 56, wherein said holding device is configured to receive said illumination source, said illumination source being directable toward the exterior scene when said holding device pivots said imaging device to said operational position.
58. The imaging system of claim 57, wherein said control is operable to selectively activate said illumination source in response to at least one of (a) said imaging device being in said operational position and (b) a detected ambient light level decreasing to a threshold level.



59. The imaging system of claim 57, wherein said control is operable to selectively activate said illumination source and said imaging device when said imaging device is moved to said stored position to determine if moisture is present on said transparent panel.

60. The imaging system of claim 56, wherein said illumination source comprises a visible light source, said control being operable to limit or block infrared and near infrared light present in the illuminated scene to reduce processing requirements.

61. The imaging system of claim 56, wherein said control is operable to apply an infrared contribution correction to the detected levels for at least some of the colors detected by said imaging device to adjust a color balance of said imaging device.

62. The imaging system of claim 50, wherein said imaging device comprises a color imaging sensor operable to capture color images of the exterior scene and an infrared imaging sensor operable to capture infrared images of the exterior scene, said control selectively activating one of said color imaging sensor and said infrared imaging sensor in response to an  
5 ambient light intensity present in the exterior scene.

63. The imaging system of claim 50, wherein said housing is pivotable to selectively position said imaging device in first and second operational positions.

64. The imaging system of claim 63, wherein said control is operable to determine a distance to at least one object in response to processing of images captured by said imaging device when in said first and second operational positions.

65. The imaging system of claim 63, wherein said control is operable to selectively move said housing to position said imaging device at said first operational position in response to the vehicle making an initial approach to a target zone and to position said imaging device at said second operational position in response to the vehicle moving further into the target  
5 zone, said imaging device being directed more downward when in said second operational position relative to said first operational position.